

# THE BIRDS OF LAKE MACLEOD, UPPER WEST COAST, WESTERN AUSTRALIA

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## INTRODUCTION

Lake MacLeod is a large salt lake between latitudes 23°30' and 24°40'S and longitudes 113°30' and 114°00'E on the upper west coast of Western Australia. The Dampier Salt (Operations) Pty Ltd salt field is situated at its southern end (Fig. 1). The lake has been of considerable interest to naturalists for many years, mainly because it supports substantial areas of mangal (mangrove plant communities). The only other block of inland mangal in Western Australia is on Mandora Station (Beard 1967).

The distribution of mangroves on the Western Australian coast is well documented (Semeniuk, Kenneally and Wilson 1978). Generally the extent and complexity of the mangal blocks and the complement of mangrove bird species within mangal blocks decreases from Wyndham down the coast to Shark Bay. Mangal is poorly developed or absent on exposed coasts such as the Eighty Mile Beach between Broome and Cape Keraudren and upper west coast between North West Cape and Carnarvon. The mangal on Lake MacLeod is at about the mid point of a 350km stretch of rocky coast between Yardie Creek and Miaboolia Beach which is devoid of mangroves.

Our purpose in visiting the lake was twofold. Firstly to establish the extent of the mangal and what birds it supported (particularly mangrove birds), and secondly, to see if Dampier Salt's operations had led to an increase in wader species and numbers such as has occurred at other salt works on the Western Australian coast, particularly Leslie Salt works northeast of Port Hedland.

Scott (1962) visited the lake in November-December 1961 and reported Zebra Finches (*Poephila guttata*), Samphire Thornbills (*Acanthiza iredalei*), Pipits (*Anthus novaeseelandiae*), White-winged Fairy Wrens (*Malurus leucopterus*) and Brown Songlarks (*Cincloramphus cruralis*) on the "flats around the marsh" and Red-capped Plovers (*Charadrius ruficapillus*) "along the margins of the lake". The absence of water birds was noted.

The lake, which is several metres below sea level and usually predominately dry, receives water from several sources. Sea water enters the lake through the tertiary limestones beneath the dunes between the coast and the lake (pers. comm. B.W. Logan). The influx of subterranean water into the Lake and its discharge onto the lake floor maintains the complex system of mangal-lined ponds comprising pure *Avicennia marina* with an understory of samphire. The area in the lake where mangal-fringed ponds occur is shown in Fig. 1. Its boundaries only indicate the extent to which the ponds occur; without inundation large areas of bare, dry, lake bed remain within them.

Until 5,100 years BP the lake was a marine basin open to the sea at its southern end. Judging by the extensive peat deposits below its surface the mangal was once much more extensive. The mangal has retreated to those areas in the lake fed by sea water seepage (pers. comm. B.W. Logan).

Fresh water enters the lake from the Minilya and Lyndon Rivers, and in times of very high rainfall in the Gascoyne drainage (as in 1980) by overflow from the Gascoyne River from the south. On these occasions the lake is flooded to a depth of about 1m.

The following notes were taken by us on 17-18 October 1980 and 10-11 November 1982 and by J.A.K. Lane (Department of Conservation and Land Management) on 1 April and 13-14 May 1977. We include some notes from Mr. J. Theunissen of Dampier Salt.

Our effort was concentrated on two areas of Cygnet Marsh: 18km SE of Gnaraloo homestead where the ponds are deepest (up to about 6m deep) and the *Avicennia* is best developed (2-7m high); and 23km ENE of Gnaraloo homestead where the ponds are shallower and fringed by many dead mangroves (the surviving mangroves are smaller and the mangal less extensive). In the following list these areas are respectively referred to as south and north Cygnet Marsh.

J.A.K. Lane concentrated on the waterfowl and waders at the south end of Cygnet Marsh. At the time of his visit the lagoon was clear and shallow and navigable with a dinghy for about 10km South of the area we worked.

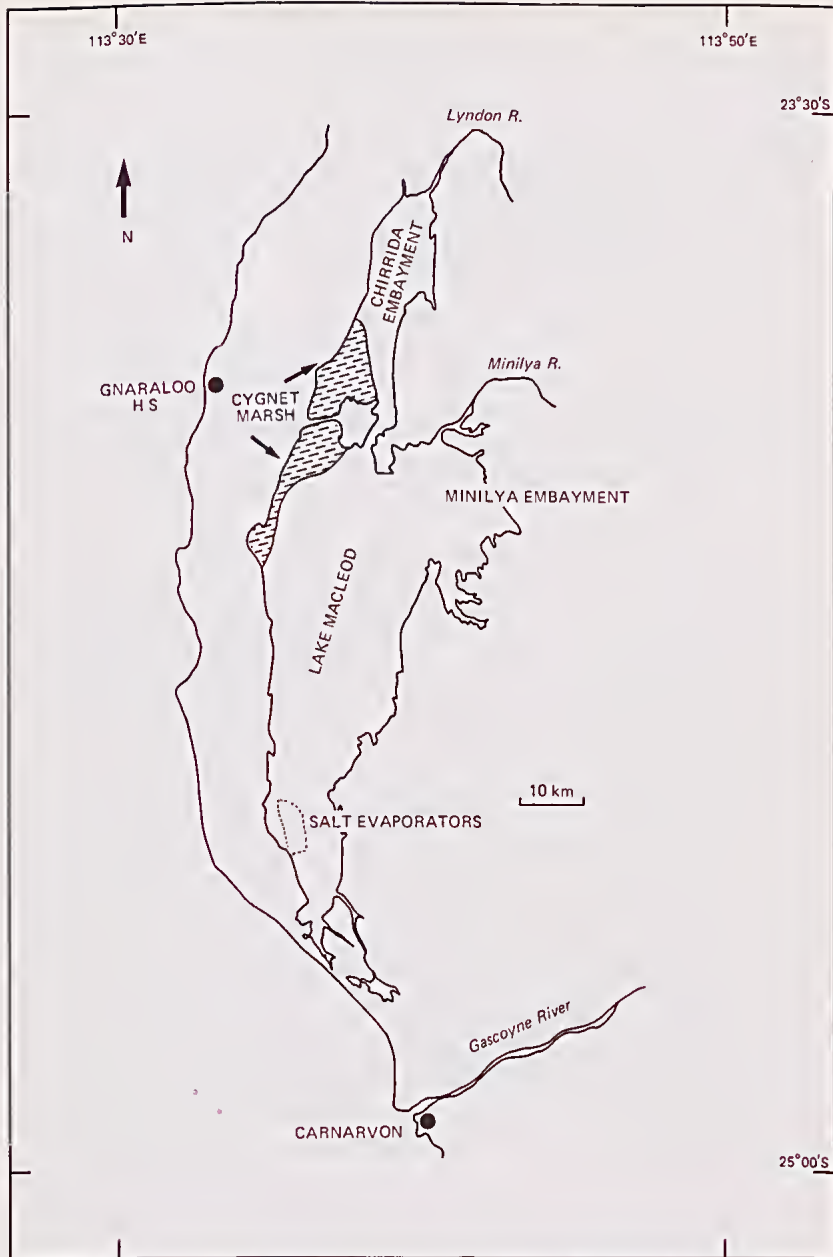


Figure 1. Lake MacLeod. Stippled area indicates the extent of Cygnet Marsh.

The following list of 48 species is restricted to those birds found in and over the mangal or associated with the salt fields at the southern end of the lake.

#### ANNOTATED LIST

Hoary-headed Grebe (*Podiceps poliocephalus*)

Flocks of up to 80 on south Cygnet Marsh in May 1977.

Great Crested Grebe (*Podiceps cristatus*)

A flock of 4 and a flock of 2 on south Cygnet Marsh in May 1977.

- Australian Pelican (*Pelicanus conspicillatus*)  
 On 13-14 May 1977 Pelicans were scattered all over south Cygnet Marsh singly or in small and large flocks up to 600-700 birds. Total population 700-1200. J.A.K. Lane noted that the water was ideal for Pelicans (clear and shallow). 17 October 1980: 17 + 6 on south Cygnet Marsh. 10 November 1982: 5 on south Cygnet Marsh.
- Little Black Cormorant (*Phalacrocorax sulcirostris*)  
 Only seen on 13-14 May 1977. Flocks of up to 100 with Pied Cormorants. Also seen in separate flocks.
- Great Cormorant (*Phalacrocorax carbo*)  
 Six at north Cygnet Marsh 11 November 1982.
- Pied Cormorant (*Phalacrocorax varius*)  
 May 1977: flocks of up to 2000, often with Pelicans and Little Black Cormorants at the northern end of south Cygnet Marsh. 16 October 1980: 10 returning to south Cygnet Marsh from the west at dusk. 17 October 1980: about 60, including some juveniles, still being fed. 10 November 1982: 11 at northern end of south Cygnet Marsh. 11 November 1982: 11 at north Cygnet Marsh. Rookery comprising 50-100 nests at northern end of south Cygnet Marsh inactive on all visits.
- Darter (*Anhinga melanogaster*)  
 Only at the deep (northern) end of south Cygnet Marsh; Eight on 17 October 1980 and ten on 10 November 1982.
- Great Egret (*Egretta alba*)  
 Frequently seen (mostly singly) on 13-14 May 1977 around the edge of south Cygnet Marsh.
- White-faced Heron (*Ardea novaehollandiae*)  
 A few at south Cygnet Marsh 13-14 May 1977; 5 at south Cygnet Marsh 17 October 1980; 1 at north Cygnet Marsh 11 November 1982.
- Little Egret (*Egretta garzetta*)  
 One in shallows on south Cygnet Marsh 13-14 May 1977.
- Mangrove Heron (*Butorides striatus*)  
 Present on each of our visits in the tallest *Avicennia* adjacent to the deepest parts of north and south Cygnet Marsh; up to 6 at north Cygnet Marsh and up to 10 at south Cygnet Marsh. Nest with 2 fresh eggs 3m up on a horizontal branch of an *Avicennia* on 11 November 1982. It comprised 80-100 sticks 100-200mm long, was flat and about 200mm in diameter.
- Rufous Night Heron (*Nycticorax caledonicus*)  
 A few in the taller *Avicennia* at north and south Cygnet Marsh on every visit.
- Black Swan (*Cygnus atratus*)  
 Several hundred in small flocks on south Cygnet Marsh on 13-14 May 1977, but not as abundant as on the 1 April 1977 aerial survey (by J.A.K. Lane). Ten on south Cygnet Marsh on 17 October 1980 and 12 on 10 November 1982. Occasionally seen at the Dampier Salt works by J. Theunissen.
- Grey Teal (*Anas gibberifrons*)  
 Flocks of up to 100 seen occasionally on south Cygnet Marsh on 13-14 May 1977. About 100 on south Cygnet Marsh 17 October 1980 and 1 on 10 November 1982. 54 on north Cygnet Marsh on 11 November 1982 and 15 at Dampier Salt works on 12 November 1982.
- White-eyed Duck (*Aythya australis*)  
 One with Grey Teal at Dampier Salt works on 12 November 1982.
- Brahminy Kite (*Haliaeetus indus*)  
 One over mangal at south Cygnet Marsh 13-14 May 1977.
- White-breasted Sea Eagle (*Haliaeetus leucogaster*)  
 One over north Cygnet Marsh 11 November 1982.
- Osprey (*Pandion haliaetus*)  
 Seen nesting on support towers for power lines by J. Theunissen at Dampier Salt works.
- Australian Kestrel (*Falco cenchroides*)  
 Two over mangal at south Cygnet Marsh on 17 October 1980 and another at the same place on 10 November 1982. One over mangal at north Cygnet Marsh on 11 November 1982 and 2 at Dampier Salt Works on 12 November 1982.
- Australian Bustard (*Otis australis*)  
 Occasionally seen by J. Theunissen at the Dampier Salt Works.
- Banded Plover (*Vanellus tricolor*)  
 Two on flats near south Cygnet Marsh on 17 October 1980.
- Grey Plover (*Pluvialis squatarola*)  
 One at south Cygnet Marsh on 13-14 May 1977.



- Red-capped Plover (*Charadrius ruficapillus*)  
 Hundreds with other waders at south Cygnet Marsh on 14 May 1977 and 50 at the same place (including several males in breeding plumage) on 11 November 1982.
- Black-fronted Plover (*Charadrius melanops*)  
 One at edge of south Cygnet Marsh on 16 October 1980 and one on 10 November 1982.
- Whimbrel (*Numenius phaeopus*)  
 One at south Cygnet Marsh and one at north Cygnet Marsh on 11 November 1982.
- Bar-tailed Godwit (*Limosa lapponica*)  
 About 12 at south Cygnet Marsh on 13-14 May 1977.
- Greenshank (*Tringa nebularia*)  
 One at south Cygnet Marsh on 13-14 May 1977, and 13 at north Cygnet Marsh on 11 November 1982.
- Red-necked Stint (*Calidris ruficollis*)  
 'Many hundred to several thousands' at south Cygnet Marsh on 13-14 May 1977; 10 at north Cygnet Marsh on 11 November 1982 and one at Dampier Salt work on 12 November 1982.
- Curlew Sandpiper (*Calidris ferruginea*)  
 'Many hundreds to several thousands' at south Cygnet Marsh on 13-14 May 1977; 25 at north Cygnet Marsh on 11 November 1982 and one at Dampier Salt Works on 12 November 1982.
- Black-winged Stilt (*Himantopus himantopus*)  
 Recorded in 'low numbers' at south Cygnet Marsh on 13-14 May 1977.
- Banded Stilt (*Cladorhynchus leucocephala*)  
 More abundant on south Cygnet Marsh than the Black-winged Stilt (perhaps in thousands) on 13-14 May 1977.
- Red-necked Avocet (*Recurvirostra novaehollandiae*)  
 Many at south Cygnet Marsh on 13-14 May 1977 but not as common as the Banded Stilt. Three at north Cygnet Marsh on 11 November 1982.
- Silver Gull (*Larus novaehollandiae*)  
 'Not in large numbers' on 13-14 May 1977. 15 at south Cygnet Marsh on 17 October 1980 and 5 on 10 November 1982. Two at north Cygnet Marsh on 11 November 1982.
- Caspian Tern (*Sterna caspia*)  
 'Abundant' at south Cygnet Marsh on 13-14 May 1977. One at south Cygnet Marsh on 11 November 1982.
- Pallid Cuckoo (*Cuculus pallidus*)  
 One immature bird in mangal at south Cygnet Marsh on 17 October 1980.
- Horsfield's Bronze Cuckoo (*Chrysococcyx basalis*)  
 One in mangal at south Cygnet Marsh on 17 October 1980.
- Welcome Swallow (*Hirundo neoxena*)  
 Two hawking over south Cygnet Marsh mangal on 17 October 1980.
- Tree Martin (*Hirundo nigricans*)  
 Eight hawking over south Cygnet Marsh mangal on 10 November 1982.
- Richard's Pipit (*Anthus novaeseelandiae*)  
 Two in open areas near samphire at south Cygnet Marsh on 17 October 1980.
- Mangrove Grey Fantail (*Rhipidura phasiana*)  
 Moderately common in mangal at south and north Cygnet Marsh during our visits. A high proportion of those seen on 17 October were buff-coloured juveniles. One juvenile still begging for food and a pair of adults carrying nesting material on 10 November 1982.
- Dusky Flyeater (*Gerygone tenebrosa*)  
 Moderately common in mangal. About 12 seen at south Cygnet Marsh and 12 at north Cygnet Marsh on each of our visits. Immature birds seen 17 October 1980 and 10 November 1982 (on the latter occasion one bird begging for food).
- Variiegated Fairy-wren (*Malurus lamberti*)  
 In mangal at south Cygnet Marsh: one party on 17 October 1980 and several parties 10 November 1982.
- White-winged Fairy-wren (*Malurus leucopterus*)  
 One party of 4, including a male in nuptial plumage, in mangal at south Cygnet Marsh on 17 October 1980.

Little Grassbird (*Megalurus gramineus*)

Ten in samphire and mangal at south Cygnet Marsh on 17 October 1980 and two on 10 November 1982. Mostly seen perched on pneumatophores of *Avicennia*.

Yellow White-eye (*Zosterops lutea*)

The most common mangal-inhabiting bird. Flocks of up to 7 at north and south Cygnet Marsh on all visits.

Singing Honeyeater (*Meliphaga virescens*)

Two in mangal at north Cygnet Marsh on 11 November 1982.

White-breasted Woodswallow (*Artamus leucorhynchus*)

Moderately common. Ten over mangal at south Cygnet Marsh on 17 October 1980 (including 3 pale-headed juveniles) and 8 at the same place on 10 November 1982.

Little Crow (*Corvus bennetti*)

Fifteen (including some immature birds) at south Cygnet Marsh on 17 October 1980. Several old nests in the mangal there also. This species nests on power poles at the Dampier Salt Works (pers. comm. J. Theunissen).

#### DISCUSSION

Most of the species in the preceding list are waterfowl and waders attracted to the open waters of the lagoons and surrounding shallows. Only five species are dependent on the mangal, namely the Mangrove Heron, Mangrove Grey Fantail, Dusky Flyeater, Yellow White-eye and White-breasted Woodswallow.

The low numbers of Laro-limicolae (shorebirds, terns etc.) observed on Lake MacLeod is in stark contrast to the large numbers occurring on other salt fields on the Western Australian coast such as Leslie Salt (near Port Hedland) and Dampier Salt (at Karratha).

The salt works at Lake MacLeod is unique in Western Australia in that the brine pumped from beneath the lake floor into evaporating ponds is supersaturated and contains little oxygen and few invertebrates. At Leslie Salt and Dampier Salt (Karratha) sea water is pumped through a series of ponds which gradually increases its salinity by evaporation. The first few ponds in this staging process are rich in oxygen and invertebrates which attract huge numbers of waders.

Presumably the ponds at Lake MacLeod are unsuitable for Laro-limicolae because of their high salinity.

#### ACKNOWLEDGEMENTS

We are grateful to J.A.K. Lane and G. Pearson, Department of Conservation and Land Management for notes on the lake, and to Dr. B.W. Logan, Geology Department, University of Western Australia, for information on the geology of the area. Messrs. J. Theunissen of Dampier Salt and B. Michael of Gnaraloo Station gave us valuable assistance and information.

#### REFERENCES

- BEARD, J.S. 1967. An inland occurrence of mangrove. *West. Aust. Nat.* 10: 112-115.  
SCOTT, T.C. 1962. A visit to the salt marsh north of Carnarvon. *West. Aust. Nat.* 8: 126-127.  
SEMENUIK, V., KENNEALLY, K.F. & WILSON, P.G. 1978. *Mangroves of Western Australia*. West. Australian Naturalist's Club, Perth.

#### POSSIBLE HYBRIDS BETWEEN *BANKSIA HOOKERANA* AND *B. PRIONOTES* (PROTEACEAE)

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#### ABSTRACT

Analysis of a distinctive group of *Banksia* shrubs near Lake Indoon, suggests that they may be hybrids between *Banksia hookerana* and *Banksia prionotes*

#### INTRODUCTION

In 1982 I was advised of a possible hybrid between *Banksia hookerana* Meisn. and *B. prionotes* Lindl. near Lake Indoon; a freshwater lake, 11 kilometres west